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**Survey of Literature Pertaining to Decision Making Styles and
Individual Factors**

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Abstract

The Joint Command Decision Support for the 21st Century Technology Demonstration (JCDS 21 TD) project investigates individual and organizational factors, as well as technology, with respect to decision making. As part of the JCDS 21 TD work plan, it is necessary to gain an understanding of current scientific research on human decision making, individual differences, and the potential to identify consistent individual preference for specific decision making styles.

The work completed under this call-up contributes to a sub-project that intends to develop strategies to achieve organizational agility and improve decision performance of the individual, team and organization. Research has indicated that a variety of individual factors affect the way in which people make decisions. In addition, individual strategies can be more or less well-suited to different kinds of task domains. Thus, it is important to develop an understanding of the individual differences in decision making strategies or approaches.

This literature survey represents the first stage of the project in which the ultimate goal is the development of a survey tool that can be used to classify the kinds of decision strategies consistently employed by an individual. This report describes the process and findings of a literature survey of current scientific literature relevant to decision making styles or strategies and individual, social and contextual factors that may affect one's selection or preference for specific decision making styles. The survey identifies relevant literature, summarizes major concepts and themes, and provides a bibliography of articles and book chapters included in the review.

Résumé

Le Projet de démonstration de technologies – Aide à la décision des commandements interarmées pour le XXI^e siècle (PDT ADCI 21) sert à examiner les facteurs individuels et organisationnels, ainsi que la technologie, en ce qui a trait à la prise de décision. Dans le cadre du plan de travail du PDT ADCI 21, il est nécessaire de comprendre la recherche scientifique actuelle portant sur la prise de décision humaine, les différences individuelles et la possibilité de cerner une préférence individuelle systématique à l'égard de styles de prise de décision particuliers.

Les travaux effectués dans le cadre de cette commande subséquente contribuent à un sous-projet qui vise l'élaboration de stratégies devant permettre de parvenir à une agilité organisationnelle et d'améliorer le rendement de l'individu, de l'équipe et de l'organisation en matière de décision. La recherche indique que toute une gamme de facteurs individuels influent sur la façon dont les gens prennent des décisions. En outre, les stratégies individuelles peuvent être plus ou moins bien adaptées à différents types de domaines de tâches. Ainsi, il est important d'en arriver à comprendre les différences individuelles entre les stratégies ou approches de prise de décision.

Cette étude de la littérature constitue la première étape du projet, dont le but ultime est l'élaboration d'un outil permettant de classifier les types de stratégies décisionnelles constamment utilisées par un individu. Le présent rapport décrit le processus et les conclusions d'une étude de la littérature scientifique actuelle portant sur les styles ou stratégies de prise de décision et sur les facteurs individuels, sociaux et contextuels qui peuvent influencer sur le choix de styles de prise de décision particuliers ou sur la préférence à cet égard. L'étude cerne la littérature pertinente, résume les principaux concepts et thèmes et fournit une bibliographie des articles et des chapitres d'ouvrages mentionnés dans le texte.

Executive Summary

The Joint Command Decision Support for the 21st Century Technology Demonstration (JCDS 21 TD) project investigates individual and organizational factors, as well as technology, with respect to decision making. As part of the JCDS 21 TD work plan, it is necessary to gain an understanding of current scientific research on human decision making, individual differences, and the potential to identify consistent individual preference for specific decision making styles.

The work completed under this call-up contributes to a sub-project referred to as Organizational and Individual Factors. This sub-project intends to develop strategies to achieve organizational agility and improve decision performance of the individual, team and organization. Research has indicated that a variety of individual factors affect the way in which people make decisions. In addition, individual strategies can be more or less well-suited to different kinds of task domains. Thus, it is important to develop an understanding of the individual differences in decision making strategies or approaches. In particular, this work seeks to identify separate decision strategies within an organized categorization scheme which is based on empirical research. This framework will serve as the basis for then exploring the individual factors that predict the use of given strategies as well as the consistency with which individuals favour any given strategy. The ultimate aim of this work is the development of a survey tool that can be used to classify the kinds of decision strategies consistently employed by an individual.

This report describes the process and findings of a literature survey of current scientific literature relevant to decision making styles or strategies and individual, social and contextual factors that may affect one's selection or preference for specific decision making styles. The survey identifies relevant literature, summarizes major concepts and themes, and provides a bibliography of articles and book chapters included in the review.

An initial search identified a total of 156 potentially relevant references. Of these, 59 of the most relevant were obtained and reviewed of which 37 were read and are included in this review.

Sommaire

Le Projet de démonstration de technologies – Aide à la décision des commandements interarmées pour le XXI^e siècle (PDT ADCI 21) sert à examiner les facteurs individuels et organisationnels, ainsi que la technologie, en ce qui a trait à la prise de décision. Dans le cadre du plan de travail du PDT ADCI 21, il est nécessaire de comprendre la recherche scientifique actuelle portant sur la prise de décision humaine, les différences individuelles et la possibilité de cerner une préférence individuelle systématique à l'égard de styles de prise de décision particuliers.

Les travaux effectués dans le cadre de cette commande subséquente contribuent à un sous-projet intitulé Facteurs organisationnels et individuels, qui a pour but d'élaborer des stratégies devant permettre de parvenir à une agilité organisationnelle et d'améliorer le rendement de l'individu, de l'équipe et de l'organisation en matière de décision. La recherche indique que toute une gamme de facteurs individuels influent sur la façon dont les gens prennent des décisions. En outre, les stratégies individuelles peuvent être plus ou moins bien adaptées à différents types de domaines de tâches. Ainsi, il est important d'en arriver à comprendre les différences individuelles entre les stratégies ou approches de prise de décision. Les travaux visent en particulier à déterminer des stratégies décisionnelles distinctes à l'intérieur d'un modèle de catégorisation organisé qui est fondé sur la recherche empirique. Ce cadre servira de base pour ensuite examiner les facteurs individuels qui permettent de prévoir l'utilisation de stratégies données ainsi que la régularité avec laquelle les individus privilégient une stratégie particulière. Le but ultime de ce projet est l'élaboration d'un outil permettant de classifier les types de stratégies décisionnelles constamment utilisées par un individu.

Le présent rapport décrit le processus et les conclusions d'une étude de la littérature scientifique actuelle portant sur les styles ou stratégies de prise de décision et sur les facteurs individuels, sociaux et contextuels qui peuvent influencer sur le choix de styles de prise de décision particuliers ou sur la préférence à cet égard. L'étude cerne la littérature pertinente, résume les principaux concepts et thèmes et fournit une bibliographie des articles et des chapitres d'ouvrages mentionnés dans le texte.

Une recherche initiale a permis de repérer au total 156 ouvrages de référence susceptibles d'être utiles. Sur ce nombre, 59 des plus pertinents ont été obtenus et examinés. Trente-sept (37) d'entre eux ont été lus et sont mentionnés dans la présente étude.

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1. Introduction

1.1 Background

As described in the Statement of Work for call-up# 7911-03 (Contract Number W7711-4-7911/01 TOR), the Joint Command Decision Support for the 21st Century Technology Demonstration (JCDS 21 TD) project investigates individual and organizational factors, as well as technology, with respect to decision making. JCDS 21 TD has developed into a large, multidisciplinary team with scientific leadership provided by DRDC Valcartier, DRDC Toronto and Director General Operational Research (DGOR). The project sponsor is Director Joint Force Capabilities (DJFC). The operational client is the Chief of Staff J3 (COS J3), and the Scientific Authority is Dr. David J. Bryant (Command Effectiveness Behaviour Group) at DRDC Toronto. The work completed under this call-up contributes to Sub-Project 3, Organizational and Individual Factors. This sub-project intends to develop strategies to achieve organizational agility and improve decision performance of the individual, team and organization, which is critical for achieving integrated planning and execution in a Joint Interagency Multinational Public (JIMP) environment. As part of the JCDS 21 TD work plan, it is necessary to gain an understanding of current scientific research on human decision making, individual differences, and the potential to identify consistent individual preference for specific decision making styles.

Research has indicated that a variety of individual factors affect the way in which people make decisions. In addition, individual strategies can be more or less well-suited to different kinds of task domains. Thus, it is important to develop an understanding of the individual differences in decision making strategies or approaches. In particular, this work will seek to identify separate decision strategies within an organized categorization scheme which is based on empirical research. This framework will serve as the basis for then exploring the individual factors that predict the use of given strategies as well as the consistency with which individuals favour any given strategy. The ultimate aim of this work is the development of a survey tool that can be used to classify the kinds of decision strategies consistently employed by an individual.

1.2 Purpose

The objective of this literature survey is to review current scientific literature relevant to decision making styles or strategies and individual, social and contextual factors that may affect one's selection or preference for specific decision making styles. The survey will identify relevant literature, summarize major concepts and themes, and provide a bibliography of articles and book chapters.

In the scope of the overall project, this literature survey will contribute to a framework that will be used to explore individual factors that predict the use of given strategies as well as the consistency with which individuals favour any given strategy.



1.3 Tasks

The following tasks were performed as part of this project:

- A search of decision making styles literature in order to:
 - Identify relevant articles, book chapters, technical papers, etc.
 - Identify the major works in the literature that will be most valuable to subsequent research efforts.
- A summary of all major concepts and themes identified in the relevant literature.
- A written report describing the literature search method and results, as well as brief summaries of the major concepts in the literature.

1.4 Approach Taken in this Report

The Method section lists the keywords used for the literature survey. The databases searched are also listed in the Method section.

The section that follows presents summaries of major concepts found in the literature relating to decision making styles and individual, social and contextual factors.

2 Methods

2.1 Databases and Keywords

The following keywords and key phrases (Table 1) were used to search the databases. The words/phrases were used in combination (one search term associated with “decision making”, and one term associated with “styles”, “individual differences”, “group factors” or “social context”). If an unmanageable number of hits resulted from a search, additional keywords were used to focus the results. A minimum of 741 searches were conducted¹.

Table 1: Keywords used in the Literature Search

Decision Making	Styles	Individual Differences	Group Factors	Social Context
Intuitive decision making	Strategy(ies)	Cognitive styles	Social loafing	Situational factors
Naturalistic decision making	Approach(es)	Information processing style	Groupthink	Mission type
Recognition-primed decision making	Preference(s)	Memory capacity	Social facilitation	Rules of engagement (ROE)
Deductive reasoning	Heuristic(s)	Emotion/Affect	Consensus	Time pressure
Rational decision making	Recognition	Demographics	Group norms	Time available
Normative decision making	Representativeness	Age	Conformity	Workload
Descriptive decision making	Simulation	Gender	Compliance	Uncertainty
Reasoning	Availability	Socio-economic status	Group identity	Risk
Judg(e)ment		Education		Task difficulty
Choice		Ethnicity		
Problem solving		Race		
Choice behavio(u)r		Nationality		
		Culture		
		Religion		

The following literature databases were searched in this survey (Table 2).

¹ The formula $P_{k,n} = \frac{n!}{(n-k)!}$ was used, where n = the total number of search criteria considered (39) and k = the number of combinations in each search (2).

Table 2: Databases Searched in the Literature Search

PsychInfo (APA)
Canadian Institute for Scientific and Technical Information (CISTI)
National Technical Information Service (NTIS)
Medline
Google Scholar

In addition, an opportunistic search for relevant information was conducted based on a paper presented at the 2005 Human Factors and Ergonomic Society (HFES) Conference. This led to the identification and inclusion of two relevant research papers. Resultant hits were considered for their appropriateness to the eventual application of this information (develop a survey tool that can be used to clarify the kinds of decision strategies consistently employed by an individual). Assuming they were deemed applicable, they were then categorized according to whether they had 'high', 'medium', or 'low' relevance. Low relevance is not intended to mean that they did not make any contribution to the state of knowledge about decision making styles; rather they only contributed a few bits of novel information to this literature review. Articles of high relevance were considered because they contain a great deal of information and shape the perception of the field. It was possible to obtain the abstracts for most articles. A summary of the relevant articles was then written to provide an overview of the major concepts.

2.2 Review of Literature

The criteria above led to the initial identification of 156 potentially relevant references. Of these, 59 of the most relevant were obtained and reviewed of which 37 were read and are included in this review. These 37 references are included because they specifically address decision making strategies rather than decision making in a broader context. From a decision making strategies standpoint, nothing would have been gained from including all 59 papers.

3 Decision Making Strategies

3.1 Important Terms

3.1.1 Level of decision making

A decision strategy is a process by which one makes a decision. The process, however, can be described at different levels, from very specific, procedural algorithms or heuristics to very general classifications of broad types of procedures or rules that govern decision making. In this review, decision strategies are drawn from theoretical and empirical work performed largely independent of one another and with little coordination of terminology. Thus, decision processes described at different levels of specificity often are associated with different labels in the literature. Detailed descriptions are often referred to as procedures, algorithms, or heuristics, whereas descriptions at a medium level of specificity are frequently referred to as processes or strategies. At the most general level, accounts of decision making are generally referred to as approaches, models, or theories. We consider all levels of specificity in this report and use the term strategy to cover all accounts of decision processes. It is vital to note, however, that not all strategies reviewed in this report provide detailed, procedural accounts. Many describe general theoretical approaches that must be operationalized to explain decision making for any particular decision task.

Given the vast amount of literature on decision making, both at the individual and group level, we found it necessary to restrict the scope of the literature survey to individual decision making with the exception of social factors influencing decision making style, which makes reference to decision making styles at the group level.

3.1.2 Models of decision making

When discussing decision making strategies, a differentiation must be made between normative, descriptive and prescriptive models of decision making. Typically, normative models focus on optimality with respect to the accuracy or success of the decision, whereas prescriptive models more often take a practical approach and measure optimality with respect to a balance of accuracy with resources, including time and processing capacity. A simple way of distinguishing between these models is as follows:

- Normative models focus on optimality with respect to the accuracy or success of the decision.
- Descriptive models illustrate how people actually make decisions; an attempt to describe reality.
- Prescriptive models more often take a practical approach and measure optimality with respect to a balance of accuracy with resources, including time and processing capacity. .

A number of decision making strategies are discussed throughout this literature survey.

These strategies may represent normative, descriptive or prescriptive models of decision making. The majority of strategies that will be discussed can be considered descriptive, in that they have been proven to be strategies that people actually use. In some cases, especially with respect to heuristics, certain strategies may be more prescriptive than descriptive. Bryant (2002), for example, described fast and frugal heuristics as prescriptive compared to Naturalistic Decision Making (NDM) which is more descriptive. This is because there are more detailed models outlining the cognitive processes involved in decision making associated with fast and frugal heuristics compared to the more generic decision making model that exists for NDM.

3.1.3 Compensatory vs. non-compensatory

Another classification of decision making models or theories is that of compensatory versus non-compensatory. These classifications relate the extent to which the models/theories make trade-offs among attributes. A model is considered compensatory if it involves identifying a complete set of attributes that could impact the success of choosing any of the available alternatives – including both positive and negative impacts. A relative importance is then assigned to all attributes and an overall value is computed for each option based on the impact of the attribute and relative weight (Dillon, 1998). Hence, analytical decision making is considered a compensatory model. In non-compensatory decision making not all relevant attributes are necessarily collected, nor in a sequential manner. Also, consideration of the relative importance of all attributes is not performed, or the benefits of some attributes are not necessarily traded off against the deficits of others (Dillon, 1998). Hence, naturalistic decision making is an example of a non-compensatory model of decision making. As described by Dillon (1998), descriptive models are generally non-compensatory while prescriptive and normative models are typically regarded as being compensatory.

3.2 Individual Decision Making Strategies

In the literature on individual decision making strategies, two strategies are common to all research: analytical (or rational) decision making and naturalistic (or intuitive) decision making (Scott & Bruce, 1995; Thunholm, 2004; Nygren & White, 2002). A number of researchers have also identified other styles such as avoidant, dependent and spontaneous. Finally, decision making heuristics, namely fast and frugal heuristics (Gigerenzer & Todd, 1999) represent specific individual decision making strategies that include principles or rules for guiding the search for information, stopping the search and making the actual decision.

3.2.1 Analytical decision making

Classical models of analytical decision making involve:

1. Identification of all alternatives involved in a decision;
2. Assignment of weights or values for all alternatives;
3. Exhaustive factor-by-factor comparison of all possible alternatives, and,

4. The selection of the optimal course of action (i.e. the one associated with the highest value).

This decision making process is intensive in terms of time requirements and cognitive resources of the decision maker (Dillon, 1998). Analytical decision making also often requires a level of knowledge that is not always available in real-life tasks (i.e. all alternatives available to the decision maker and the weights associated with each). Various researchers also refer to analytical decision making as vigilant decision making (Johnston, Driskell & Salas, 1997).

3.2.2 Naturalistic or intuitive decision making

NDM focuses on actual, observable behaviours and situation constraints including time and knowledge (Bryant, 2002). That is, NDM is a descriptive, rather than a normative, model of decision making. Models within the NDM framework share three main principles:

1. Decisions are made by holistic evaluation of alternative Courses of Action (COA) rather than by feature-by-feature comparison of alternatives (Bryant, 2002);
2. Decision makers rely on recognition of the situation and pattern matching of COAs rather than an exhaustive generation and comparison of alternatives (Bryant, 2002), and,
3. Decision makers adopt a satisficing criterion rather than search for an optimal solution (Bryant, 2002).

Bryant noted that, although NDM models appear to accurately describe the way in which experts make decisions under uncertainty and time pressure (e.g. military decision making), NDM remains general, referring to broad categories of cognitive processes such as recognition, pattern matching and mental simulation (Bryant, 2002).

NDM is often also referred to as intuitive decision making, suggesting that we make decisions intuitively based on our experience, rather than by systematically and exhaustively comparing attributes and alternatives.

Nygren and White (2002, p. 953) state that “decision strategies are often characterized as being intuition-based or analytically-based” and that one’s preference for either strategy is the result of a propensity toward using a particular decision making style. In creating a measure of decision making styles, they found that analytical and intuitive styles appear to be two independent unipolar dimensions and not opposite ends of one unidimensional continuum. This implies that a decision maker is not necessarily analytical or intuitive, but may score high on both scales. In this literature review, the terms NDM and intuitive decision making are used interchangeably.

3.2.3 Avoidant, dependent and spontaneous decision making strategies

Many individual researchers have identified other decision making styles beyond that of analytic or intuitive. Scott and Bruce (1995) developed a measure of decision making style, suggesting that a decision making “style” is an individual choice or habit that depends on characteristics of the individual rather than the situation or task at hand. They defined decision style as “the learned, habitual response pattern exhibited by an individual when confronted with a decision situation. It is not a personality trait, but a habit-based propensity to react in a certain way in a specific decision context” (Scott & Bruce, 1995). That is, they assume that decision making style will be consistent over time given a certain decision task and context. Although early researchers in the area (e.g. Hunt et al., 1989) identified just two decision making styles – analytics and intuitives, after conducting a review of theoretical and empirical research in the area, Scott & Bruce (1995, p. 820) identified four potential decision styles in the process of creating the measure:

1. Rational – characterized by a thorough search for and logical evaluation of alternatives;
2. Intuitive – characterized by a reliance on hunches and feelings²;
3. Dependent – characterized by a search for advice and direction from others, and,
4. Avoidant – characterized by attempts to avoid decision making.

However, a fifth factor emerged following factor analysis of the measure; a spontaneous decision making style, characterized by a sense of immediacy and a desire to make the decision as soon as possible. Their results suggested that decision making styles are not mutually exclusive. That is, individuals rely on a combination of styles, rather than just a single style, when making a decision.

Research by Thunholm (2004) on decision making styles used by military officers supports Scott & Bruce’s (1995) five decision making styles. Thunholm found several correlations between selected decision making styles and personality traits, which is described further in Section 4.1.3 later in the report. Thunholm’s findings also supported the conclusion made by Scott and Bruce (1995) that styles are not mutually exclusive and that people tend to use more than one decision making style, although one style seems to be dominant. Based on the results, Thunholm proposed that decision making style should not be viewed as merely a habit but as a style, and also proposed the following definition of decision making style:

the response pattern exhibited by an individual in a decision making situation. This response pattern is determined by the decision making situation, the decision making task and by the individual decision maker. Individual differences between decision makers include differences in habits but also differences in basic cognitive abilities such as information processing, self-evaluation and self-regulation, which have a

² Note that this definition of intuitive decision making differs from that used in the context of NDM. Intuitive decision making (or NDM) models do not follow formal, logical procedures as in analytic decision making. Rather, it adheres to the three principles described in Section 3.2.2 above.

consistent impact on the response pattern across different decision making tasks and situations. (Thunholm, 2004, p. 941)

Nygren and White (2002) also created a measure of decision making styles known as the Decision Making Styles Inventory (DMI). The items of their scale were found to differentiate among three decision making styles: analytical, intuitive and regret-based (or avoidant) decision making; these definitions are the same as those identified by Scott and Bruce (see section 3.2.3).

3.2.4 Fast and frugal heuristics

The notion of decision making heuristics first became known in the 1970's during which Tversky and Kahneman (cited in Todd & Gigerenzer, 2000) launched their 'heuristics-and-biases' program. The three main heuristics that arose from this program include representativeness, availability, and anchoring and adjustment. Unfortunately the association of heuristics and biases "tainted the idea of simple mental mechanisms by attaching them to the value-laden biases term in a single inseparable phrase." (Todd & Gigerenzer, 2000, p. 739) That is, the heuristics and biases movement emphasized how heuristics can lead to systematic errors and lapses in reasoning that suggest human irrationality. However, Todd and Gigerenzer (2000) maintain that heuristics are an essential cognitive tool for making reasonable decisions. They have defined the functions and processes associated with fast and frugal heuristics more precisely than in the past and have built computational models that include specific rules for information search, stopping and decision making.

Todd and Gigerenzer (2001) note that while NDM models lack the scientific rigor to produce specific models of the cognitive processes involved in decision making, fast and frugal heuristics "offer a way to develop computational models within the framework of NDM." (Bryant, 2002, p. 1) Fast and frugal heuristics, like NDM, exist under the umbrella of non-compensatory strategies.

Fast and frugal heuristics employ a minimum of time, knowledge and computation to make adaptive choices in real environments. These decision making strategies limit their search of objectives or information using easily computable stopping rules, and they make their choices with easily computable decision rules. That is, fast and frugal heuristics include principles or rules for guiding the search for information, stopping the search and making the actual decision. Within fast and frugal heuristics, a number of classes of heuristics have been defined (Gigerenzer & Todd, 1999). A non-comprehensive list includes:

- 1) Ignorance-based decision making – the decision maker must select one option from only two possibilities;
- 2) One-reason decision making – the decision maker stops looking for cues as soon as one is found that differentiates between the two options being considered;
- 3) Elimination heuristics – the decision maker selects a single option from multiple options by using successive cues to eliminate alternatives, and,

- 4) Satisficing heuristics – an aspiration level is set for the selection criterion being used and the sequential search for alternatives is stopped as soon as the aspiration is met.

These classes are differentiated by either the searching, stopping or decision making rules that they employ. Todd and Gigerenzer (2000) state that humans are thought to react adaptively to their environment by choosing the appropriate heuristics contingent on task demands, however, it has not yet been addressed how individual heuristics are selected from the adaptive toolbox for application to specific problems.

The validity of fast and frugal heuristics has been studied by many researchers resulting in inconclusive evidence. Broder (2003) investigated whether the tendency to use the Take the Best (TTB) heuristic (a one-reason decision making heuristic) in an artificial stock market game. He found that more intelligent participants tended to use the TTB heuristic but only in a non-compensatory environment, not in a compensatory environment. He also found that neither memory capacity nor memory load had a significant impact on strategy choice. He did find, however, that the cost relative to the utility of information for making a decision resulted in a shift to a TTB strategy. Overall, Broder's (2003) findings appear to support the existence of a TTB heuristic; however it remains unclear which cues people use to select different decision making strategies.

The findings of Newell, Weston and Shanks (2003) clearly dispute the validity or even existence of the TTB heuristic. Newell, Weston and Shanks (2003) found that some participants continued buying information even if it was useless and this behaviour did not change as a function of experience. That is, some people appear to prefer to acquire more information, even when it is unnecessary, rather than relying on frugal information. The authors concluded that there are individual differences in preferences for decision making strategies that override the influence of contextual and decision making task characteristics. Subsequent research by Newell and Shanks (2003) again found that even though there was a tendency for people to use the TTB heuristic when there is a higher cost of information relative to potential profit, TTB is not clearly universally adopted.

3.3 Group Decision Making Styles

There were four group decision making styles (Yousef, 1998) relating to group and social factors and decision making styles common to the literature reviewed:

1. *Autocratic Style*: Decisions are solved by a leader using information available to him/her without considering others in the group.
2. *Participative Style*: The group gathers information, evaluates alternatives, and comes to a majority decision.
3. *Consultative Style*: Decisions are made by the leader following consultation with members of the group. The decisions may or may not reflect the group's influence.
4. *Delegatory Style*: Leader delegates others in the group to make decisions on their own.

Again, the resulting focus of this literature survey was on individual rather than group decision making styles. Therefore it should be noted that an exhaustive literature review of group decision making styles was not performed as it was not within the scope of this work.



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4 Factors affecting selection of decision making strategy

4.1 Factors of the Individual Decision Maker

4.1.1 Age

Research in this area suggests that older adults have slower information processing speed, shorter working memory span, more difficulty inhibiting irrelevant information, and slower activation of relevant information compared to young adults (Chen & Sun, 2003). It has been suggested that as a result of these cognitive changes associated with age, older adults adapt by selecting decision making strategies that demand less cognitive resources but are still effective, namely satisficing heuristics. Chen and Sun (2003) examined age differences in a financial decision making task where young and older adults were asked to sell a series of objects at a yard sale for the highest possible price where offers were randomly presented. The study concluded that both young and older adults used forms of heuristics in making a decision. However, older adults used a heuristic that required the memorization of only the first offer for each object, whereas younger adults used a strategy that required comparison of the first offer with several previous offers on other objects. The authors also determined that older adults were more likely to consistently use one heuristic whereas younger adults switched between two heuristic strategies.

Kim and Hasher (2005) also found that older adults have an increased propensity to rely on heuristic or intuitive information processing, while younger adults have an increased propensity to rely on analytic, systematic information processing. Their results also suggested that older adults are less susceptible to changing their decisions or decision making strategy because of greater experience with decision making in general. Kim and Hasher (2005) propose that these results can be at least partially attributed to Damasio's somatic marker hypothesis which states that feelings or emotions (somatic markers) become associated with positive and negative outcomes of responses to situations through a lifetime of experience (cited in Kim & Hasher, 2005). Therefore, older adults have greater experience and more formulated intuitions that may guide them and make them more consistent in decision making.

Research by Riggle and Johnson (1996) also supported the finding that older adults are more likely to use a satisficing strategy in evaluating political candidates. Specifically, the authors found that older adults accessed less information, thereby not exhaustively searching for all possible information as one would if using an analytic strategy. They did, however, take longer to examine information and make choices. Riggle and Johnson (1996) concluded that older adults are more likely to organize their information searches by political candidates and to engage in satisficing, compared to younger adults.

4.1.2 Gender

Only one reference identified by our search addressed the issue of gender and decision making strategy, albeit indirectly. Keltikangas-Jarvinen and Terav (1996) found that in both Finland and Estonia, girls preferred a more prosocial strategy than boys. The authors presented students with a hypothetical situation in which “neither your friend or enemy is repeatedly teased by your classmates” and asked what they would do (p. 718). They considered that the students took a prosocial strategy if they said they would stand up for the victim and would tell the teasers to stop teasing. That is, they would think about the feelings of the victim and consider supporting him or her.

However, no additional articles were located that directly addressed gender and decision making strategy so we make the assumption that gender is not an individual factor that significantly contributes to the use of a particular decision making strategy.

4.1.3 Personality

A significant amount of research was found relating decision making strategy to various dimensions of one’s personality including locus of control, innovativeness, social desirability, self esteem, Myers-Briggs Type Indicators (i.e. sensing, feeling, perceiving, etc.), risk seeking, goal orientation, need for cognition, personal need for structure and personal fear of invalidity.

4.1.3.1 Locus of control

Research suggests that individuals with an internal locus of control (i.e. they believe they are in control of their destiny) are more likely to use a rational decision making style (Scott & Bruce, 1995; Thunholm, 2004). Even though there are multiple definitions of rationality that incorporate non-analytic processes, rational decision making as defined by Scott and Bruce (1995) and Thunholm (2004) is synonymous with an analytic process.

Conversely, those with an external locus of control (i.e. they believe that their destiny is in the control of others or another) are more likely to rely on others or shift the responsibility of making a decision to others. That is, they would be more likely to utilize a dependent, avoidant or spontaneous decision making style (Scott & Bruce, 1995; Thunholm, 2004).

Nygren and White (2005), however, found that those individuals who endorse both analytical and intuitive decision styles are more likely to report greater assurance of their ability to perform well and be in control of events, which may be interpreted as having an internal locus of control. This suggest that individuals with a high internal locus of control, who perceive themselves in control of events, are more flexible in their decision making strategy and select the most appropriate strategy for a given decision.

4.1.3.2 Innovativeness

Scott and Bruce (1995) and Thunholm (2004) both found that innovativeness is inversely associated with rational, dependent, avoidant and spontaneous decision making styles. That is, the less innovative an individual is, the more likely it is that he/she will adopt a rational, dependent, avoidant or spontaneous decision making style. Conversely, an individual’s

innovativeness was positively related to an intuitive style of decision making, suggesting that more innovative individuals are more likely to take responsibility for a decision and approach the problem in a manner that is based on experience and intuition rather than analytic procedures (Scott & Bruce, 1995; Thunholm, 2004). These results appear to have face validity in that it is conceivable that those individuals who are less innovative would prefer a structured and rational style of decision making. On the other hand, they may prefer to avert responsibility for a decision and rely on others or avoid the decision altogether.

4.1.3.3 Social desirability

Social desirability bias reflects an individual's desire to be socially desirable or acceptable. Scott and Bruce (1995) and Thunholm (2004) determined that ratings of social desirability are positively correlated with rational decision making and negatively correlated with intuitive, spontaneous, and avoidant decision making styles. This suggests that individuals who have a high level of desire to be socially acceptable are more likely to use a rational decision making style. It is suggested that this may be related to a fear of making errors during the decision process and the desire to use a decision making process that is systematic and rational, with regards to accountability in organizational structures (i.e. does the organization punish errors more than it rewards successes, etc.).

4.1.3.4 Self esteem

Several researchers have determined that one's overall self esteem is related to certain decision making strategies. Scott and Bruce (1995), Thunholm (2004), and Nygren and White (2002) found that low ratings of self esteem are related to both avoidant and dependent decision making styles. Individuals with low self esteem may avoid responsibility for making a decision and therefore rely on others or avoid the decision altogether. In other words, self esteem is likely related to locus of control, such that an individual with low self esteem is more likely to have an external locus of control and thereby take less responsibility, rely more on others, or choose avoidance when making a decision than people with relatively high self esteem.

However, recent research by Nygren and White (2005) suggests that those individuals who endorse both analytical and intuitive decision styles are more likely to report higher self esteem. This may suggest that an individual with high self esteem may be more confident and flexible in their approach to decision making. That is, they are confident in using a strategy that they deem to be most appropriate for a given decision type.

4.1.3.5 Myers-Briggs Type Indicator personality indicators (extraversion, introversion, sensing, intuition, thinking, feeling, judging, perceiving)

The Myers-Briggs model of personality is based on four preferences, each of which has two options:

- Where do you get your energy? (*extraversion or introversion*)
- How do you prefer to process information? (*sensing or intuition*)
- How do you prefer to make decisions? (*thinking or feeling*)
- How do you prefer to make sense of things in your life? (*judging or perception*)

Clearly one could make an association between thinking and analytical decision making as well as intuition and intuitive or naturalistic decision making. However, the personality indicators listed above are often combined to define a specific personality type. Hough and Ogilvie (2005) classified a sample of managers as either Intuiting/Thinking or Sensing/Feeling. They defined Intuiting/Thinking managers as those who use their intuition to make cognitive leaps, while Sensing/Feeling types use time to seek socially acceptable decisions. Not surprisingly, the authors found that Intuiting/Thinking managers are more likely to use an intuitive decision making style, while Sensing/Feeling types use more of a rational style. These results were also supported by the work of Huitt (1992). This also supports the research on social desirability described above in that individuals seeking social desirability are more likely to use an analytic decision making style.

4.1.3.6 Risk-seeking

In general, research has found that intuitive decision makers are likely to be more risk-seeking, impulsive and have a greater belief in luck, while analytic decision makers tend to be less risk seeking and less impulsive (Nygren & White, 2002; Barber, 2005). Even though the authors provide no theoretical account of why this may be so, it is conceivable that individuals preferring a systematic and rational style of decision making are more risk avoidant than risk seeking.

Risk-seeking can also be associated with other personality traits that may thereby be associated with decision making strategy selection. Soane and Chmiel (2005) investigated risk and personality across three domains – work, health and personal finance. They found that risk taking is positively associated with extraversion and openness, but negatively associated with neuroticism, agreeableness and conscientiousness. Even though this research does not provide evidence of a direct relationship between risk seeking behaviour and decision making strategies, the fact that the authors found a relationship between risk and certain personality traits and the fact that a relationship has been found between personality traits and decision making styles (see Section 4.1.3.7 below), suggests that there may be an indirect relationship between risk and decision making strategy.

4.1.3.7 Agreeableness and conscientiousness

In a recent investigation of personality and decision making styles, Nygren and White (2005) found that a high score on analytical and/or intuitive decision making style is associated with positive personality characteristics including agreeableness and conscientiousness. In fact, those individuals who employ both intuitive and analytical decision making styles are more likely to score higher on the personality scales of agreeableness and conscientiousness as measured by the International Personality Item Pool (IPIP) (see Nygren & White, 2005 for further information on the IPIP scales). It may be suggested that individuals who are more agreeable and conscientious are more flexible in their decision making strategy and are more willing to use the strategy that is most suited to the decision task and context.

4.1.3.8 Goal orientation

An individual's goal orientation (i.e. how his/her goal can be characterized) with respect to decision making can be classified as either learning or performance goal oriented (Smith, 2005). Performance goal oriented decision making is characterized by an individual's desire to prove one's competence to others (Smith, 2005), whereas learning goal oriented decision making is characterized by an individual's desire to acquire new skills (Smith, 2005). Research by Nygren and White (2002) suggests that both learning and performance goal oriented individuals are more likely to be analytic decision makers. Smith (2005) found a high positive correlation between analytic decision making style and learning goal orientation only. Smith (2005) also found a strong relationship between regret-based (or avoidant) decision making and both learning and performance goal orientation.

4.1.4 Cognitive Style

4.1.4.1 Need for cognition

Need for Cognition is defined as an individual's tendency to engage in and enjoy effortful cognitive endeavours (Blais, Thompson & Baranski, 2003). Research suggests that individuals who have a high need for cognition are more analytic in nature and hence more likely to use an analytic decision making style (Nygren & White, 2002; Blais, Thompson & Baranski, 2005).

4.1.4.2 Personal fear of invalidity

Blais, Thompson and Baranski (2003) define high Personal Fear of Invalidity (PFI) individuals as cautious decision makers who are concerned with the costs of error, show discomfort if errors are made, are more likely to see alternatives but vacillate between options and often delay making decisions. Although this has not been empirically determined, it is conceivable that high PFI individuals would prefer more of an avoidant (or regret-based) decision making style and avoid making a decision.

4.1.4.3 Personal need for structure

Individuals who have a high Personal Need for Structure (PNS) are compelled by a need for order and consistency (Blais, Thompson & Baranski, 2003). High PNS individuals often base their judgments on the initial information encountered and are more resistant to incorporating conflicting evidence. Even though there was no empirical research found to support this, the characteristics of a high PNS individual suggest that these individuals would prefer more of a satisficing (i.e. intuitive or heuristic) style of decision making in which a course of action that satisfies a minimum requirement is selected (i.e. satisficing), as opposed to an optimal course of action (i.e. optimizing).

4.2 Social factors

4.2.1 Culture

4.2.1.1 *Collectivist vs. individualistic cultures*

Yi and Park (2003) characterize individualistic cultures as those that:

- Value personal goals over group goals, personal concerns over group concerns, personal rights and needs over collective responsibilities and obligations;
- Make group decisions by majority vote and place more importance on independence and the self; maximize individual interests or rewards of any particular decision, and,
- Are usually found in North America.

They characterize collectivist cultures as those that:

- Value group goals over personal goals, group concerns over personal concerns, and collective needs over personal needs;
- Are more skilled at collective decision making;
- Make group decisions by consensus with emphasis on cooperation, harmony, and interdependence in social life, and,
- Are usually found in Asia, Africa, Latin America and the Pacific.

Research by Brew, Hesketh and Taylor (2001) suggests that Collectivist cultures (i.e. Hong Kong, Taiwan) are more likely to use an avoidant and intuitive (i.e. satisficing over optimizing) decision making style, whereas individualistic cultures (i.e. Australia, U.S.) are more likely to use an analytical (i.e. focus on optimizing) style. In terms of group decision making, collectivist cultures tend to use a participative or delegatory style, while individualist cultures tend to use a more autocratic or consultative style.

The findings of Yi and Park (2003) only partially support the hypothesis that individuals in Collectivist cultures (i.e. China, Korea, Japan) are more likely to use a more participative decision making style than Individualistic cultures (i.e. Canada, United States). The authors found that Collectivist cultures were indeed more likely to use what they refer to as cooperative and collaborative decision making than Individualistic cultures. However, contrary to their hypothesis, they also found that individuals in Collectivist cultures were more likely to use competitive and dominant decision making styles. As defined by Yi and Park (2003), cooperative and collaborative decision making is analogous with a participative group decision making style (as defined in Section 3.3), while dominant decision making style is consistent with an autocratic style (also defined in Section 3.3).

Based on theoretical research by Weber (2000) individuals in Collectivist cultures frequently use a unique decision making mode, which they termed *folk-precedent-matching-method*. This decision strategy is characterized by the decision maker searches for precedents that are often stories and legends in the past. If the current decision problem

is deemed similar to the past situation, the appropriate action is to simply do what was done before. One could say that this is similar to a naturalistic decision making strategy in that it involves situation recognition and pattern matching. Weber (2000) noted that westerners (individualistic culture) are self-oriented and are driven by maximizing individual profit. These individual-oriented goals are linked to the use of an analytic decision making strategy in that it involves the evaluation and combination of probability and outcome information for the purpose of maximizing the expected utility and minimizing the costs.

Keltikangas-Jarvinen and Terav (1996) investigated decision making strategies in Finnish (i.e. individualist) and Estonian (i.e. collectivist) adolescents. They determined that individuals from the Collectivist country used a more aggressive strategy and showed lower levels of social responsibility in decision making than their peers from the Individualist country. Withdrawing was the most typical way of solving social problems among students in the Collectivist country.

The approach to decision making used in different cultures may also depend on the context of the decision. For example, Peterson, Miranda, Smith and Haskell (2003) found that Chinese (collectivist culture) tend to be more risk seeking in financial situations and less risk seeking in social situations than individualist cultures. Given the relationship between risk seeking and decision making styles discussed in Section 4.1.3.6, one could conclude that Chinese may be more likely to use an intuitive style when making financial decisions but a more analytic decision making style in social situations.

4.2.1.2 Other specific cultures

Schramm-Neilson (2001) investigated differences in decision making between the French and Danish. They concluded that the French analyze problems in a systematic way, looking for as many alternatives as possible and trying to evaluate them before coming to a conclusion and then go back to see whether there might be more possibilities to be considered or other ways of doing things. In other words, the authors claim that the French use a deductive model of decision making and emphasize optimizing (i.e. analytical decision making) over satisficing (i.e. intuitive or heuristic decision making). Conversely, the Danish, on the other hand, prefer to “get down to action” and use less time looking for alternatives and evaluating them (Schramm-Neilson, 2001). That is, they focus more on satisficing (i.e. intuitive style) than optimizing (i.e. analytical style).

4.2.2 Groupthink

Our literature survey identified only one research study that investigated groupthink and decision making. Groupthink can be defined as a mode of thinking people engage in when they are deeply involved in a cohesive group, when the members’ striving for unanimity override their motivation to realistically appraise alternative course of action (Johnson, 2001). Theoretical research by Johnson (2001) on military decision making suggests that there are many conditions that may contribute to groupthink:

- The leader promotes one idea very early in planning instead of encouraging the generation of many ideas,
- Social cohesion – being a team player
- Time pressure
- External threat
- Pressures of conformity
- Collective rationalization
- Illusion of unanimity

All of these conditions can lead to groupthink. In terms of decision making strategy, it is likely that in conditions where groupthink is a factor, the decision making strategy will be non-analytic in that the focus is not on identifying all possible information and weighing all options. Therefore, it may be argued that an intuitive or heuristic strategy that is used. In terms of group decision making, it appears that a consultative style would most appropriately describe a decision situation involving groupthink in that it does not necessarily support equal input from group members and the decision does not necessarily reflect the actual preferences of the individual group members. On the other hand, there is the possibility that in situations of groupthink more information is used (suggesting rational analyses), but that certain information is given too much weight or emphasis and that disconfirming evidence is not given enough weight. Therefore, on the surface groupthink appears rational, yet it is conceivably driven by already established intuitive responses that are not overturned by the available evidence.

4.2.3 Social loafing

The literature survey identified only one research study that addressed social loafing and decision making styles. Research by Henningsen, Cruz and Miller (2000) found that social loafing (when individuals work collectively in order to reduce their individual effort on a task) increases with group size. In terms of decision strategy used by the group, the author found that information recall was lower, thus reflecting less effortful information processing, when individuals anticipated making a decision in a group compared to making a decision alone. Even though social loafing and decision making style were not directly related in this study, it is conceivable that less effortful information processing, which is related to social loafing, could result in a shift away from analytical decision making in which all information and options are considered, to a satisficing style where not all attributes are analyzed and alternatives compared.

4.3 Factors of the Context or Decision Task

4.3.1 Type of behaviour

Research has suggested that the type of decision behaviour or task can affect the type of decision making strategy selected. Watt (2000) reviewed 438 aviation hazard reports and

categorized them according to Ramussen's skill-rule-knowledge schema (cited in Watt, 2000). Specifically, Watt (2000) linked decision making styles in the reports to the types of behaviour involved, whether skill-based, rule-based (simple and those involving some judgement) or knowledge-based.

It was concluded that decisions involving simple rule-based behaviour (70% of sample) would be most appropriately served by a pure analytic decision making strategy. This is because decisions involving simple rule-based behaviour often require the operator to choose the proper checklist or procedure from a myriad of possibilities and must use a structured or logical analysis to do so. Therefore, these decisions require little in the way of experience or judgement. For these reasons, Watt (2000) concludes that an analytical decision making strategy would be most appropriate to handle situations involving simple rule-based behaviour which are most likely to be well-defined tasks.

Decisions involving more complex rule-based (8% of sample) as well as knowledge-based behaviour (18%) would be best served using a hybrid analytic and naturalistic decision making strategy. This is because the ability to correctly assess a situation and choose the most appropriate behaviour would likely require cognitive skills that are based on experience and pattern recognition, thus exhibiting characteristics of naturalistic decision making. However, some of the hazard reports involving complex rule-based and skill-based behaviour described errors resulting from the improper performance of procedures suggesting that the decisions would involve choosing an optimal solution from clearly defined options that are based on complete and reliable information. Watt (2000) concludes that these are characteristics of analytical decision making situations and therefore certain complex rule-based and skill-based behaviour would be best served using an analytical decision making strategy.

Finally, situations involving skill-based behaviour (18% of sample) involve complex decisions where experience and judgement are critical. According to Watt (2000) "using past experience to recognize a familiar situation, mental simulations and role-play of future events typify recognition-primed decision making and are the core of knowledge-based decisions" (p. 51). Hence, situations involving skill-based behaviour would be best served using a form of naturalistic decision making.

4.3.2 Time pressure

A fair amount of research has addressed the effect of time pressure on the decision making process and decision making strategies. Payne, Bettman and Johnson (1988) found that people respond to time pressure in a decision making context by: 1) processing only a subset of information (filtering), 2) accelerate processing yet process all information, and 3) shift processing strategies. The authors noted that participants appear to adapt to severe time pressure by employing all three adaptation methods. In situations of moderate, rather than severe time pressure however, participants do not appear to change strategy, only filter and accelerate information. In severe time pressure situations, individuals shifted their decision making strategies toward the use of attribute-based heuristics and away from normative procedures (i.e. analytical decision making). They also noted that these

attribute-based strategies were more accurate than the normative procedures. These results suggest that under moderate time pressure, individuals will either increase the rate at which they acquire and process information or process only a subset of information. However, under more severe time pressure, the extent to which time pressure can be overcome by increasing speed is limited by processing capacity and as a result a change has to be made in the decision making strategy.

Maule, Hockey and Bdzola (2000) investigated information processing under time pressure and also found that participants used both filtration and acceleration to adapt to time-pressure. That is, individuals intentionally reduced the number of information sources looked at, as well as time spent looking at the information sources. They did not, however, link this change in information processing to any shift in decision making strategies used by individuals under time pressure.

Finally, research by Kerstholt (1994) investigated decision strategy shift in a dynamic situation under severe levels of time pressure. According to Kerstholt, strategy shift can be inferred from the relative times spent on the various decision phases, such as information search and the execution of actions. Two decision strategies were considered:

- Action-oriented – characterized by action without information requests (acquisition)
- Judgement-oriented – characterized by increased information requests or acquisition followed by an action

Results showed that as time pressure increased, less time was spent on all decision phases. However, overall, participants spent relatively more time on information search and action selection (with less time for feedback), implying the use of a judgement-oriented strategy. This strategy was used across all time pressure conditions. It was determined, however, that the judgement-oriented strategy did not lead to optimal performance in all time-pressure conditions. It was suggested that this could have been related to factors influencing participants' motivation for information acquisition and actions (e.g. the relative cost of information and actions).

4.3.3 Ambiguity

Ambiguity is another characteristic of the decision environment that appears to have an effect upon the decision strategies used by decision makers. Similar to the results of time pressure, increased ambiguity in a situation results in an increase in the cognitive load of the decision maker. Driggers (1997) investigated the effects of ambiguity on foreign policy decision strategies, focusing on the last two steps of the decision process – information search/cognitive calculation and choice. Research suggests that as ambiguity increases, decision makers are more likely to use a poliheuristic decision making style (i.e. a combination of heuristic strategies) than a rational or pure intuitive style of decision making. Driggers (1997) describes four theories used to study foreign policy decision making:

1. Rational choice theory – individuals rank all possible states of the world in regard to their desirability, then use knowledge of relationships between strategies and desired goals and select the *optimal* decision.
2. Cybernetic decision theory – individuals employ decision strategies that have been proven in the past or are part of organizational norms and operating procedures. Use a decision rule of satisficing (i.e. heuristic or intuitive-based decision making).
3. Prospect theory – individuals do not maximize utility but evaluate outcomes with respect to deviations from a reference point, and give more weight to losses than to comparable gains (i.e. a specific heuristic).
4. Poliheuristic theory – individuals use a variety of strategies and heuristics to develop a decision.

Results suggest that decision makers may utilize combinations of a number of different strategies in order to cope with increasing cognitive strain due to ambiguity. That is, they use a poliheuristic strategy. Interestingly, it was also noted that accuracy in the decision did not vary as a function of decision strategy, suggesting that appropriate strategies were used in order to make decisions.



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5 Conclusions

The objective of this literature survey was to review current scientific literature relevant to decision making styles or strategies and individual, social and contextual factors that may affect one's selection or preference for specific decision making styles. Research within the domains of organizational behaviour (i.e. management), medicine, politics, education and the military were included in the literature survey.

We have identified three high level classes of factors that have demonstrated relationships to decision making strategy: personal, social and contextual factors. Within each of these three classes, we have identified specific characteristics that are linked to decision making strategy, however, in general there is limited empirical support for all. In fact, some factors have very little empirical support.

Table 2, 3 and 4 below outline the various personal, social and contextual factors identified in the literature as well as their relationship to specific decision making styles.

Overall, this literature survey identified that there is no existing, well-defined and comprehensive framework for identifying individual factors and specific decision making strategies. Similarly, the literature survey also revealed that there is no candidate assessment tool in existence that could be used to classify personal preferences for decision making.

However, the individual factors identified do provide a starting point for investigating the predictive power of individual factors in decision making style preference.

Table 2: Person-Based Factors and Dominant Decision Making Style(s)

Factor	Analytical	Naturalistic	Avoidant	Dependent	Spontaneous	Heuristics
Age						
<i>*Young</i>	x					x
<i>*Old</i>		x				x
Personality						
Locus of Control						
<i>*Internal</i>	x	(x)				
<i>*External</i>			x	x	x	
Innovativeness						
<i>*Less</i>	x		x	x	x	
<i>*More</i>		x				
Social Desirability						
<i>*High</i>	x					
<i>*Low</i>		x	x		x	
Self Esteem						
<i>*High</i>	x	x				
<i>*Low</i>			x	x		

Factor	Analytical	Naturalistic	Avoidant	Dependent	Spontaneous	Heuristics
Myers-Briggs Type Indicator						
<i>*Intuiting/Thinking</i>		X				
<i>*Sensing/Feeling</i>	X					
Risk Seeking						
<i>*Less</i>	X					
<i>*More</i>		X				
Agreeableness and Conscientiousness						
<i>*High</i>	X	X				
Goal Orientation						
<i>*Learning Goal Orientation</i>	X		X			
<i>*Performance Goal Orientation</i>	X		X			
Cognitive Style						
Need for Cognition						
<i>*High</i>	X					
Personal Fear of Invalidity						
<i>High</i>			X			
Personal Need for Structure						
<i>High</i>		X				X

Parentheses highlight secondary style

* indicates empirical support

Table 3: Social/Group Factors and Dominant Decision Making Style(s)

Factor	Analytical	Naturalistic	Avoidant	Dependent	Spontaneous	Heuristics
Culture						
Individualistic vs. Collective						
<i>*Individualistic</i>	X					
<i>*Collective</i>		X	X			
Other Specific Cultures						
<i>*French</i>	X					
<i>*Danish</i>		X				
Groupthink						
<i>High</i>	X	X				X
Social Loafing						
<i>High</i>		X				

Parentheses highlight secondary style

* indicates empirical support

Table 4: Context/Situation Factors and Dominant Decision Making Style(s)

Factor	Analytical	Naturalistic	Avoidant	Dependent	Spontaneous	Heuristics
Type of Behaviour						
<i>Simple Rule-Based</i>	x					
<i>Complex Rule Based</i>	x	x				
<i>Knowledge Based</i>	x	x				
<i>Skill Based</i>		x				
Time Pressure						
<i>*High</i>						x
Ambiguity						
<i>*High</i>						x

Parentheses highlight secondary style
 * indicates empirical support



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List of Acronyms

The following acronyms and abbreviations have been used in this paper.

Acronym	Definition
APA	American Psychological Association
CISTI	Canadian Institute for Scientific and Technical Information
COA	Course of Action
COS J3	Chief of Staff J3
DJFC	Director Joint Force Capabilities
DGOR	Director General Operational Research
DMI	Decision Making Styles Inventory
HFES	Human Factors and Ergonomics Society
IPIP	International Personality Item Pool
JCDS 21 TD	Joint Command Decision Support for the 21 st century Technology Demonstration
JIMP	Joint Interagency Multinational Public
MBTI	Myers-Briggs Type Indicator
NDM	Naturalistic Decision Making
NTIS	National Technical Information Service
PFI	Personal Fear of Invalidity
PNS	Personal Need for Structure
ROE	Rules of Engagement
TTB	Take the Best heuristic

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(U) The Joint Command Decision Support for the 21st Century Technology Demonstration (JCDS 21 TD) project investigates individual and organizational factors, as well as technology, with respect to decision making. As part of the JCDS 21 TD work plan, it is necessary to gain an understanding of current scientific research on human decision making, individual differences, and the potential to identify consistent individual preference for specific decision making styles.

The work completed under this call-up contributes to a sub-project that intends to develop strategies to achieve organizational agility and improve decision performance of the individual, team and organization. Research has indicated that a variety of individual factors affect the way in which people make decisions. In addition, individual strategies can be more or less well-suited to different kinds of task domains. Thus, it is important to develop an understanding of the individual differences in decision making strategies or approaches.

This literature survey represents the first stage of the project in which the ultimate goal is the development of a survey tool that can be used to classify the kinds of decision strategies consistently employed by an individual. This report describes the process and findings of a literature survey of current scientific literature relevant to decision making styles or strategies and individual, social and contextual factors that may affect one's selection or preference for specific decision making styles. The survey identifies relevant literature, summarizes major concepts and themes, and provides a bibliography of articles and book chapters included in the review.

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(U) decision making preferences; individual differences; literature review; Joint Command Decision Support for the 21st Century Technology Demonstration (JCDS 21 TD)

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